Documentation sheet

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Title Density Measurements in the Base Flow Region of HRV Afterbody-Nozzle Configuration

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Abstract

A preliminary study to document the mean density field using Background Oriented Schlieren (BOS) has been carried out on a 1:10 scaled model of HSTDV afterbody-nozzle configuration system at a freestream Mach number of 3.5 with unit Reynolds number of 38×10^6 per meter. The results show that the mean density field is quite adequately captured with the BOS technique with the derived Schlieren results matching well with conventional Schlieren images and with density data derived from pressure measurements on the ramp. While the data at nozzle exit is not reliable due to strong asymmetric 3D effects, presumably due to the flow expansion on the cowl lip influencing the flow field in the vicinity, the results show that flow field variable like density shows local effects better (e.g. local effect of the cowl extension) and this has been captured by the BOS whereas the wall static pressures do not show this effect. Streamwise variation of the density along the jet centerline and parallel to the ramp are presented showing that useful quantitative information can be extracted through this technique. The results would be useful for CFD code